

COMPUTATION SHEET OF BELLOWS DESIGN

NANJING UNIVERSITY OF TECHNOLOGY

SHAPE OF EXPANSION:

SHAPE OF BELLOWS: U SHAPE UNREINFORCED

INSIDE DIAMETRE: 80 mm CONVOLUTION HEIGHT: 13 mm

CONVOLUTION PITCH: 15 mm NUMBER OF CONVOLUTIONS IN ONE BELLOWS : 10

BELLOWS NOMINAL MATERIAL THICKNESS OF ONE PLY: 0.50 mm

NUMBER OF BELLOWS MATERIAL PLIES OF THICKNESS : 2

BELLOWS MATERIAL: 06Cr19Ni10(304)

DESIGN TEMPERATURE: 20 °C

MODULUS OF ELASTICITY AT DESIGN TEMPERATURE: 195000 MPa

YIELD STRENGTH AT DESIGN TEMPERATURE : 574.86 MPa

PRESSURE: 1.0 MPa

AXIAL MOVEMENT : 25 mm

LATERAL DEFLECTION: 0 mm

ANGULAR ROTATION : 0 degree

ALLOWABLE STRESS AT DESIGN TEMPERATURE: 138. MPa

SAFE FACTOR OF FATIGUE : 10

ALLOWABLE FATIGUE LIFE: 1037 CYCLE

WEIGHT OF ONE BELLOWS: .81 Kg

BELLOWS AXIAL ELASTIC SPRING RATE PER CONVOLUTION: 1517.81 N/mm

OVERALL BELLOWS AXIAL SPRING RATE: 151.78 N/mm

OVERALL BELLOWS LATERAL SPRING RATE: 107.29 N/mm

OVERALL BELLOWS BENDING SPRING RATE: 2.93 N · m/ °

BELLOWS TANGENT CIRCUMFERENTIAL MEMBRANE STRESS DUE TO PRESSURE S1:
13.17 MPa

COLLAR CIRCUMFERENTIAL MEMBRANE STRESS DUE TO PRESSURE S1': 14.17 MPa

BELLOWS CIRCUMFERENTIAL MEMBRANE STRESS DUE TO PRESSURE S2: 22.11 MPa

BELLOWS MERIDIONAL MEMBRANE STRESS DUE TO PRESSURE S3: 7.05 MPa

BELLOWS MERIDIONAL BENDING STRESS DUE TO PRESSURE S4: 107.09 MPa

BELLOWS MERIDIONAL MEMBRANE STRESS DUE TO DEFLECTION S5: 19.3 MPa

BELLOWS MERIDIONAL BENDING STRESS DUE TO DEFLECTION S6: 1118.67 MPa

LIMITING INTERNAL DESIGN PRESSURE BASED ON COLUMN INSTABILITY: 1.62 MPa

LIMITING INTERNAL DESIGN PRESSURE BASED ON INPLANE INSTABILITY AND LOCAL PLASTICITY : 5.09 MPa

THE STATIC THRUST DUE TO INTERNAL PRESSURE: 6.9398 KN

NATURAL FREQUENCY (AXIAL)(1-5 MODES): NATURAL FREQUENCY(LATERAL)(1-5 MODES):

Hz	Hz

BELLOWS TANGENT LENGTH: 30mm

BELLOWS TANGENT COLLAR LENGTH: 30mm

THICKNESS OF REINFORCING COLLAR: 2.00mm

DESIGN TEMPERATURE OF REINFORCING COLLAR: 20°C

MATERIAL OF REINFORCING COLLAR:Q245R

MODULUS OF ELASTICITY OF REINFORCING COLLAR AT DESIGN TEMPERATURE:
195000 MPa

ALLOWABLE STRESS OF REINFORCING COLLAR AT DESIGN TEMPERATURE:137 MPa

THE DESIGN OF SOFT ACCORDING TO: STANDARDS OF THE EXPANSION JOINT MANUFACTURES ASSOCIATION(TENTH EDITION-2008)